

# PATENT SPECIFICATION

DRAWINGS ATTACHED

896.485



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## COMPLETE SPECIFICATION

### Improvements in or relating to Means for Coupling a Connector to the Resistant Armouring of Flexible Tubes

We, PIRELLI SOCIETE PER AZIONI, a Joint Stock Company organised under the Laws of The Republic of Italy, of Centro Pirelli, Milan, Italy, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is for improvements in or relating to means for coupling a metallic connector to the metallic cords of the armouring of a flexible tube employable in oil drilling or similar operations where high pressures are involved.

Such high pressure flexible tubes are connected by the metallic cords of the armouring to a rigid metal tubular connector in various ways, the most popular of which is by means of setscrews.

The efficiency of such a means of connection is generally low due to the pressure of each screw being confined to a small area and to the cords being considerably bent about the area of pressure of the screws. Consequently the stress which is imparted by the screws to the individual wires which make up the cords is irregular and changeable resulting in the life of the cords being shorter than their section would warrant.

In order to increase the efficiency of such connections between the cords and the connector, cords of highly resistant wire strands have been resorted to which, even although they do reduce the danger of breaks occurring in the bending zone they do not completely eliminate those defects, because breakages of the individual cores take place with their consequent disconnection from the connector to which they should be connected.

The object of the present invention is to ensure a more uniform distribution of the load over the section of each cord whilst avoiding any sudden bending. This is achieved by arranging pairs of cords of two superimposed layers of cords in cavities formed in a portion of the connector and maintaining the said

cords in the said cavities by wedges acting for example between the cords of each pair or between the upper cord of a pair and the wall of the cavity.

The surfaces of the wedges which bear upon the surfaces of the cords are so shaped that they bear upon a large proportion of the transverse section of the cord whilst the remaining smaller portion of the transverse section of the cord bears against a section of the cavity which corresponds to the remaining cross-section of the cord. Further the length of the connection formed by the wedges between the connector and the cords is equal to at least twice the pitch of the helix of the cord strands, thus eliminating any possible release of the cords due to a loss in tension of the cords during the use of the tube.

The wedges are disposed in such a way that under stress they tend to couple the cords to the connector tightly and strongly.

The invention will be more particularly described with reference to the accompanying drawings, in which:

Figure 1 illustrates a connector in which the connection to an armoured tube is shown partly in section and partly with the rubber exterior of the tube removed.

Figure 2 illustrates in section a detail of the connection illustrated in Figure 1;

Figure 3 illustrates a section on the line A—B of Figure 2;

Figure 4 illustrates a modified form of the invention illustrated in Figure 1;

Figure 5 illustrates in section a detail of the connection illustrated in Figure 4; and

Figure 6 illustrates a section line C—D of Figure 5.

Referring to the drawings a flexible tube 1, outwardly and inwardly coated with rubber or a like resilient material is connected to a tubular metallic connector 2 by cords 4 and 5 of the tube 1 being held by friction in suitable cavities 6 formed in the connector 2. The cords 4 and 5 form the resistant structure of the tube 1 and are generally disposed in

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two layers of crossed helices. The portion 3 of the connector is provided with a series of the cavities 6 into which the cords 4, 5 are threaded in superimposed relationship. The connection of the cords 4 and 5 to the connector 2 is effected by means of wedges 7. In Figures 1, 2 and 3 the wedges 7 are shown as inserted between two layers of cords, which due to the action of the wedges are forced against the upper and lower walls of the cavities 6.

Figures 4, 5 and 6 illustrate a modification of the arrangement illustrated in Figures 1, 2 and 3 in which wedges 8 are inserted between the upper cords 5 of the pairs of cords 4 and 5 and the upper wall 9 of the cavities 6.

As will be observed from Figure 3, each wedge 7 has a contour two faces of which correspond to the side walls of the cavity 6 and two other faces each of which correspond to at least one half of the surface of each of the cords 4 and 5.

Likewise, in the embodiment illustrated in Figure 6, the transverse sectional shape of the edge 8 is such that one face conforms to at least one half of the surface of the upper cord 5, whilst the lower cord 4 is arranged in contact with the lower surface of the cavity 6, which is at least semi-cylindrical in cross-section and has a transverse sectional outline corresponding to that shown in Figure 3.

The upper surface 9 of the wedge 8 and the upper surface of the cavity 6 are rectilinear and the sides of the wedge 8 correspond to the side walls of the cavity 6.

In this way the connection of the cords to the connector is effected without any stress other than friction which the cords withstand without damage or deformation.

In order to ensure that all the strands of each cord are equally stressed, it is advisable to ensure that the length D of the cavity is at least double that of the pitch of the helix of the cord strands.

In addition to the layers of rubber and metal cords, the tube may be provided with

textile reinforcing layers located between the rubber interior and the cords, and/or between the cords and the rubber exterior of the flexible tube.

#### WHAT WE CLAIM IS:—

1. A method of connecting a hollow metallic connector to a series of pairs of metallic cords forming the resistant armouring of high pressure flexible tubes, wherein a wedge holds each pair of armouring cords in a cavity formed in the metal connector.

2. A method of connecting a hollow metallic connector to a series of pairs of metallic cords as claimed in Claim 1, in which the wedge is disposed between the lower and the upper cords of a pair of superimposed cords.

3. A method of connecting a hollow metallic connector to a series of pairs of metallic cords as claimed in Claim 1, in which the wedge is disposed between one core of a pair of superimposed cores and the adjacent wall of the cavity.

4. A method of connecting a hollow metallic connector to a series of pairs of metallic cords as claimed in any one of the preceding claims, in which the surfaces of the wedges which bear upon the surfaces of the cords are so shaped that they bear upon a larger portion of the transverse sectional configuration of the said cord than the remaining transverse section configmate.

5. A method of connecting a hollow metallic connector to a series of pairs of metallic cords as claimed in any one of the preceding claims in which the length of the cavities is at least double that of the pitch of the helix of the strands constituting the cords.

6. The method of connecting a hollow metallic connector to a series of pairs of metallic cords forming the resistant armouring of high pressure flexible tubes substantially as hereinbefore described with reference to Figures 1, 2 and 3 or Figures 4, 5 and 6 of the accompanying drawings.

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Fig. 1.

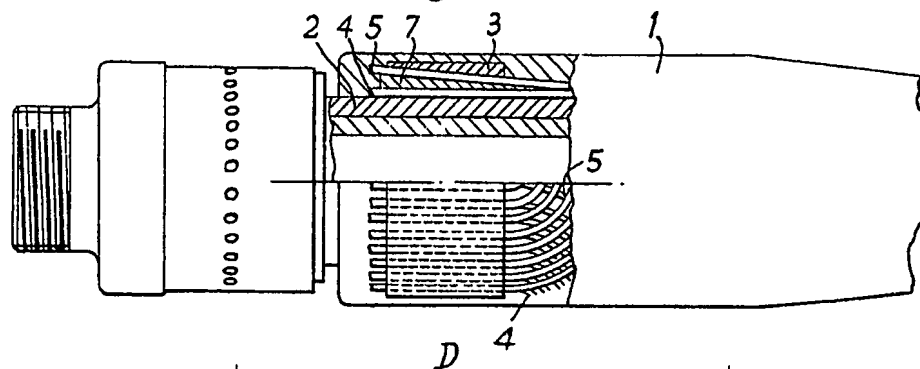


Fig. 2.

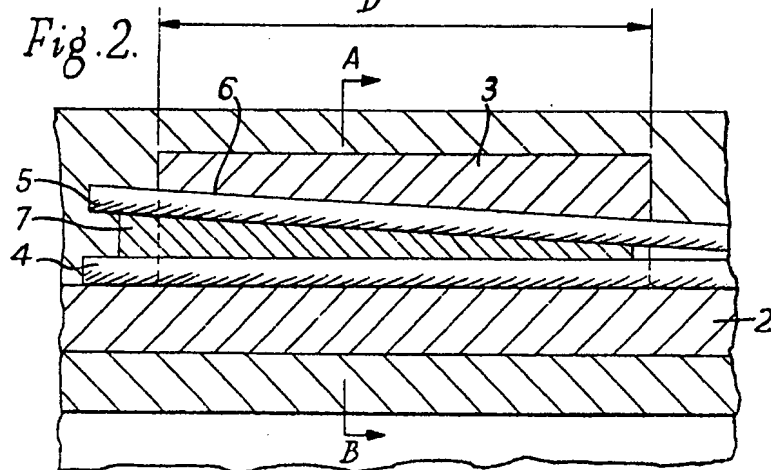
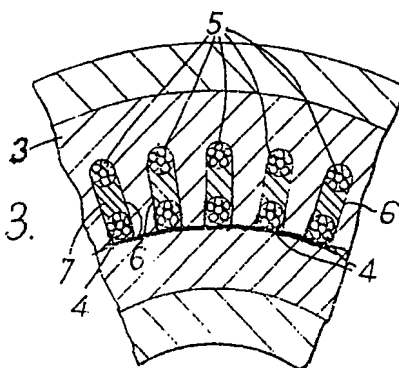


Fig. 3.



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COMPLETE SPECIFICATION

2 SHEETS

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the Original on a reduced scale.

SHEETS 1 & 2

Fig. 4.

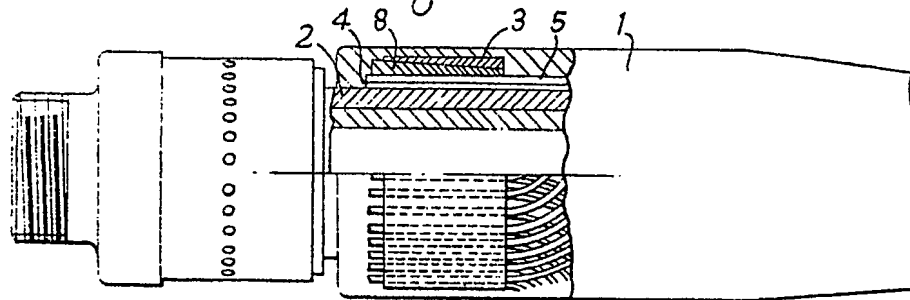


Fig. 5.

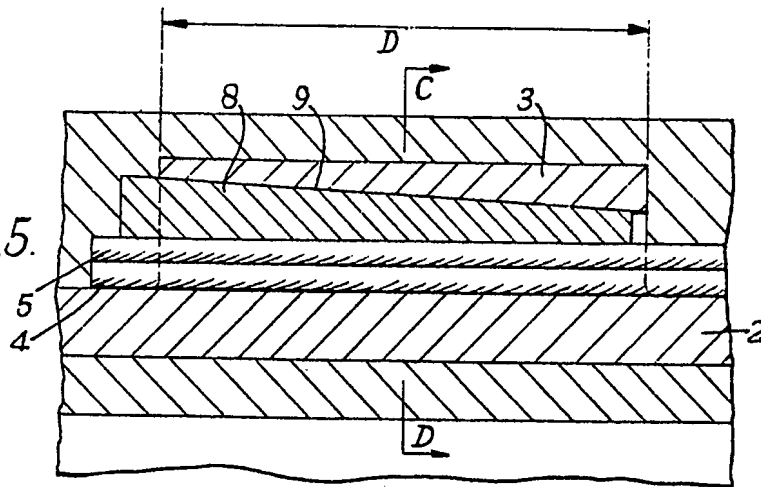
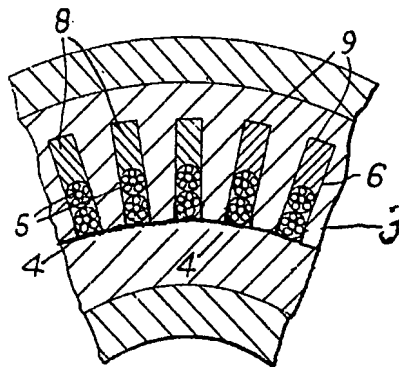


Fig. 6.



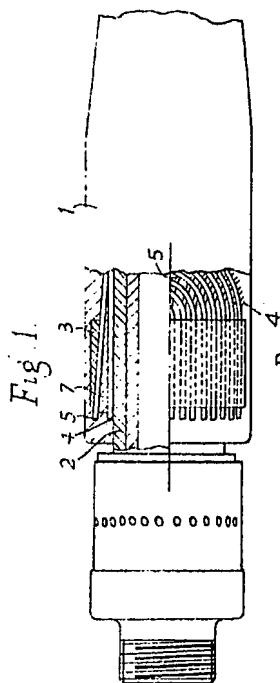


Fig. 1.

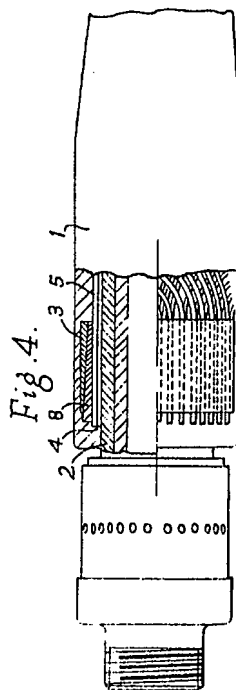


Fig. 4.

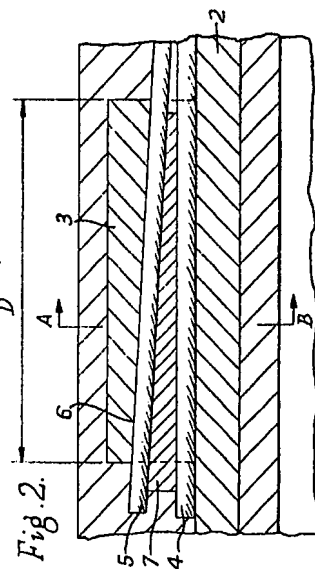


Fig. 2.

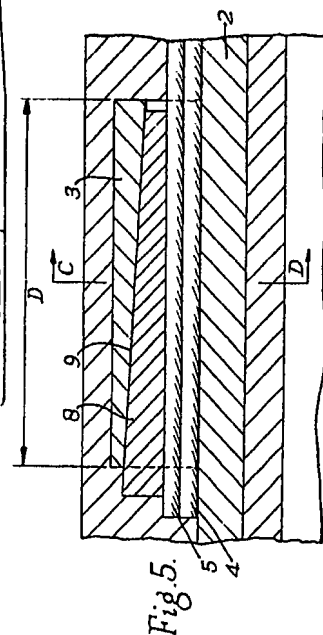


Fig. 5.

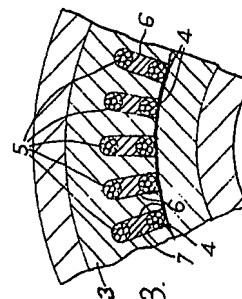


Fig. 3.

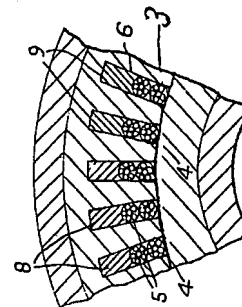


Fig. 6.